Report on the investigation of

the grounding of

mv *Willy*

Cawsand Bay, Plymouth Sound

1 January 2002

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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the cause with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AB	-	Able Seaman
BA	-	British Admiralty
CCTV	-	Close Circuit Television
DTLR	-	Department For Transport Local Government and Regions
GPS	-	Global Positioning System
HCO	-	Harbour Control Officer
IFO	-	Intermediate Fuel Oil
kg	-	kilogram
kW	-	kilowatt
LOF	-	Lloyd's Open Form
m	-	metre
OOW	-	Officer of the Watch
QHM	-	Queen's Harbour Master
SCOPIC	-	Special Compensation P and I Clause
SOSREP	-	Secretary of State's Representative for Pollution and Salvage
UTC	-	Universal Time Co-ordinated
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Services

GLOSSARY OF TERMS

Ship's swinging circle – the circle centred on the ship's anchor, the radius of which is determined by the length of cable laid out plus the length of the ship.

Bridge swinging circle – as above, but determined by the length of cable plus the horizontal distance between the ship's stem and the bridge.

SYNOPSIS

At 2250 (UTC) on 1 January 2002, mv *Willy* grounded in Cawsand Bay, Plymouth Sound, after dragging her anchor. The accident was reported to the MAIB by SOSREP via the DTLR Duty Officer at 0030 on 2 January, and an investigation was started immediately. Safety Bulletin 1/2002 **(Annex B)** was issued on 18 January 2002 on the basis of preliminary findings.

The following factors contributed to the accident:

- The ship was exposed to strong south-easterly winds in Cawsand Bay which, together with pitching owing to her light condition and the swell, increased the loading on her cable and anchor.
- The amount of cable used was insufficient given the prevailing weather conditions, depth of water, nature of the seabed, and condition of the ship.
- The overall speed at which the anchor was dragged, limited the time available in which to take corrective action to about 16 minutes.
- The ship's movement was not detected immediately by the OOW because the position of the anchor had not been determined accurately, the bridge swinging circle had not been calculated or plotted, and the GPS guard zone was set at a distance almost three times the radius of the swinging circle.
- The master was not informed of the situation until about 7 minutes after the anchor had started to drag.
- The OOW did not start the main engine until ordered to do so by the master.
- The engine could not be started and made available in sufficient time to allow the ship to be manoeuvred clear of danger.
- No consideration was given to paying out additional cable to stop the anchor from dragging.

The safety recommendations to ship owners and masters contained in Safety Bulletin 1/2002 remain valid.

Photograph courtesy of FotoFlite

Willy

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS MV *WILLY* AND ACCIDENT

Vessel details

Registered owner	:	Reederei TMS “Willy”
Manager	:	Carl F Peters
Port of registry	:	Limassol
Flag	:	Cyprus
Type	:	Product Tanker
Built	:	1981, Rensburg
Classification society	:	Germanischer Lloyd
Construction	:	Steel
Length overall	:	105.75m
Gross tonnage	:	3070
Engine power	:	1821kW
Service speed	:	12.25 knots
Other relevant info	:	Distance from stem to bridge 90m. Direct drive engine

Accident details

Time and date	:	2250 (UTC) on 1 January 2002
Location of incident	:	Cawsand Bay, 50°20.18N 004°11.64W
Persons on board	:	12
Injuries/fatalities	:	0
Damage	:	Constructive total loss

1.2 NARRATIVE

All times are UTC, and are considered to be accurate to within 3 minutes. All courses are true.

1.2.1 Events before anchoring

During 30 December 2001, *Willy*, a German owned and managed product tanker, discharged her cargo of unleaded petrol at Cattewater, Plymouth. She then sailed at 2030, with a pilot embarked, for an anchorage in Cawsand Bay to await further orders. The master had been given a choice of either anchorage No. 14 or No. 15 **(Figure 1)** by Longroom Port Control, and agreed with the pilot that No. 15 would be the better of the two anchorage positions. This was because it was further to the west and there would be less chance of the ship impeding the fairway of the western entrance to Plymouth Sound. The master also advised the pilot of his intention to use 4 shackles of cable in the water. The master had used 3 shackles of cable the previous night in Cawsand Bay while waiting for an alongside berth, but considered additional cable to be appropriate given the uncertainty of the duration of his stay.

The anchorage was approached on a course of about 250° at a speed of 2 knots, with the pilot advising the master of all helm and engine movements. The engine was put to Half Astern to check the headway as the ship approached the anchorage, and the port anchor was let go when the pilot advised that the ship was in the charted position of the anchorage by radar. No allowance was made for the distance from the radar aerial to the anchor.

1.2.2 Events at anchor

After the anchor had been let go, the engine was reduced to Slow Astern to pay out 4 shackles of cable to the waterline. During this period, the pilot confirmed that Longroom Port Control was content with the ship's position, which the master also checked by radar. A 3-cable guard zone based on *Willy's* position was set on the Leica MK8 GPS. This was the standard distance used, as lesser distances had previously led to a large number of false alarms being generated. The main engine was then shut down.

The following day, the wind was north-east force 3 to 4, and the ship was steady in her anchorage position. Several safety drills and routine maintenance were conducted during the day, and the equipment required to make the ship 'gas free' was also rigged on the upper deck. However, this was not used because of the proximity of local villages downwind. New Year's Eve was not celebrated on board.

During 1 January, the wind gradually veered to the south-east and increased. The master was aware that the ship's anchorage was now exposed, and he, personally, monitored the ship's position on the bridge for much of the

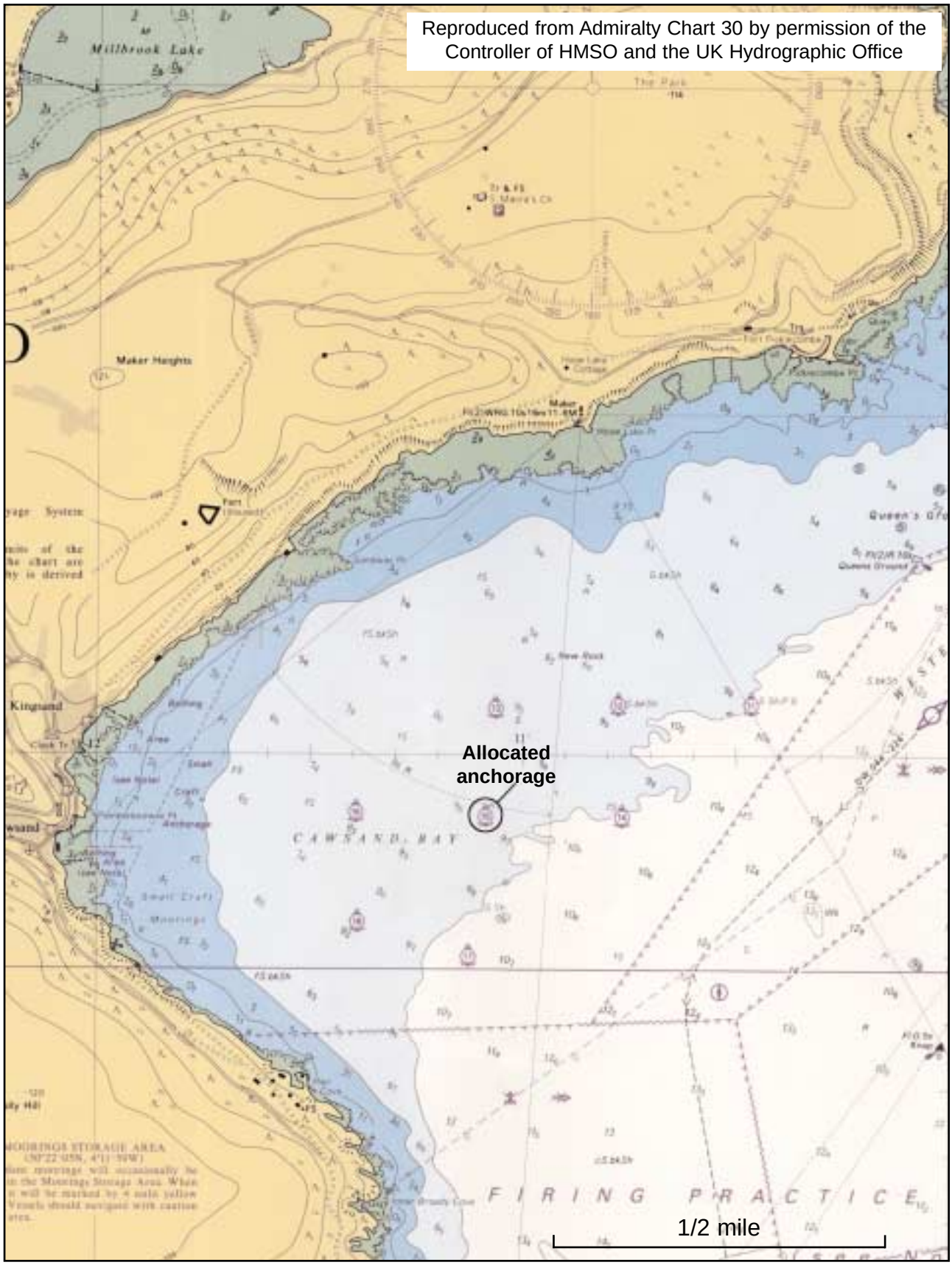

Chart extract showing the designated anchorages in Cawsand Bay

afternoon. The ship was now pitching heavily in the swell running through the western entrance to the Sound. Although this increased the loading on the cable, no movement away from the anchorage position, or any signs that the anchor was dragging, were detected. Reassured by his checks, the master returned to his cabin, from where he could monitor the ship's movement relative to several buoys, which he could see from his windows. He returned to the bridge during the evening when the tide was turning, but again no signs of the ship dragging her anchor were evident; the ship was heading into wind, and appeared to be steady.

At about 2235, the GPS alarm sounded, indicating the ship was on the limit of the 3-cable guard zone set in the GPS receiver. The chief officer, who had been standing at the chart table studying the local charts, immediately checked the radar and determined that the shore to the north-west was at a range of between 2.5 and 2.8 cables. He then spent 3 to 4 minutes trying to confirm the ship's position. As he was doing this, Longroom Port Control, who had been alerted by an observer from the shore, called *Willy* via VHF radio to advise that the ship was drifting to the west. The chief officer agreed, and immediately informed the master of the situation by telephone.

Several minutes earlier, the master had felt a sudden movement as the ship's head swung towards the north. When told that the ship was dragging her anchor, immediately he ordered the chief officer to start the engine, then went directly to the bridge. The order to start the engine was passed to the chief engineer who, because he was not dressed, immediately relayed this instruction to the second engineer who was on duty.

When the master arrived on the bridge, he checked the radar and GPS. He saw the ship was very close to the shore, and that her speed over the ground was 1.3 knots. After confirming the proximity of the shore visually from the port bridge wing, and discussing the situation with the chief officer, the chief officer was sent forward to heave in the anchor. During this period, the ship's speed by GPS reduced to 0.4 knots.

The second engineer started the engine within 5 minutes of being alerted, but by the time control was transferred to the bridge, the ship was only about 50m from the rocks. Although the master immediately put the engine to Full Ahead, moments later there was a loud bang in the vicinity of the steering compartment; the propeller had struck the rocks before any discernible movement ahead had been achieved. The engine was then put to Full Astern, and the chief officer was ordered to stop heaving in the anchor. The ship, however, did not move, so the engine was put to Stop.

1.2.3 Events after grounding

After being informed by the master, at 2251, that *Willy* had grounded, Longroom Port Control immediately tasked the duty tug to assist. The master also advised Longroom Port Control that *Willy* was not gas free, and passed the state of her bunkers. The ship was badly damaged; several cargo tanks had been ruptured, the steering motors were no longer running, and the engine room was flooded. Brixham Coastguard assumed responsibility for the co-ordination of the emergency response, and alerted the police, the fire and rescue service, and the duty principal counter-pollution and salvage officer. The emergency towing vessel *Far Sky* was also tasked to proceed to Plymouth.

The risk of explosion, caused by the residue in the empty cargo tanks, prevented the use of a helicopter to rescue the crew, and the sea state and depth of water precluded the use of the Plymouth lifeboat, which had been launched. The crew were, therefore, evacuated from the ship by the Tamar coastguard team using cliff lines and a pilot ladder from the shore, and were clear of the ship by 0204 on 2 January. A 1000m-exclusion zone was then established around the ship, and approximately 100 people were evacuated from the village of Kingsand.

On 2 January, a salvage control unit, headed by SOSREP, was set up in support of QHM Plymouth, and the owner agreed a salvage contract with United Salvage Ltd under the terms of LOF 2000 with SCOPIC incorporated. An environment group was set up at English Nature headquarters in Exeter. Venting of the cargo tanks began on 2 January, and by 5 January it had been confirmed that the ship was gas free. After removing all fuel oils, other than about 7 tonnes of IFO, and sealing and pressurising the cargo tanks with compressed air, *Willy* was refloated at 1319 on 11 January. She was then taken to Falmouth, where inspection in dry dock revealed extensive damage to her hull.

1.3 CHART PREPARATION

For the shift from Cattewater to the anchorage, the second officer had drawn a limiting danger line on the chart, based on chart datum and the ship's maximum draught. A departure plan from Plymouth Sound had also been prepared, but there was no plan to take the ship to the anchorage. The ship's swinging circle was not calculated or shown on the chart, either before or after anchoring.

1.4 ANCHOR ROUTINE

1.4.1 Engineering

The engine room was not manned, but the chief and second engineers kept 24-hour watches as the duty engineer, who was expected to stay dressed and ready. The second engineer was the duty engineer on 1 January and conducted a set of engineering rounds at 2200. From anchoring on 30 December, no maintenance was conducted on the main engine, which was available for use within 10 to 15 minutes. One steering motor was kept running. On the evening of 1 January, because of the wind and limited sea room at the anchorage, the chief engineer had told the second engineer that if he received the order to start the main engine, to do it as quickly as possible.

1.4.2 Bridge

The ship's position was monitored routinely by radar while at anchor by either the chief officer or second officer, who alternated 6 hour watches as OOW on the bridge. The chief officer kept the 0600-1200 and 1800-2400 watches, and it was normal procedure to log the ship's position every 2 hours. An extract of the deck log, showing the radar ranges and bearings recorded on 1 January, is at **Annex A**. The chief officer normally checked the ship's position by measuring the range from the western head of Plymouth Breakwater, and marking with a pencil dot the ship's position on the chart.

An AB was not required to be on the bridge, but was available if required, and conducted fire and safety rounds every 4 hours.

1.5 CAWSAND BAY

Cawsand Bay lies within the limits of the Dockyard Port of Plymouth, and ships are allowed to anchor in the designated berths when authorised to do so by the Queen's Harbour Master. No dues are charged for ships anchoring within the limits of the Dockyard Port. There are eight designated anchorage berths within Cawsand Bay – numbers 11 to 18 **(Figure 1)**. Anchorage No. 15 has a charted depth of between 9.6 and 9.7m, and the sea bottom in its vicinity is a mixture of sand and shells.

Advice given in the Admiralty Sailing Directions (NP 27) states:
Anchorage *can be obtained in Cawsand Bay (50°20'0N, 4°12'0W) sheltered from all except SE winds. Mariners should anchor clear of the recommended track for deep-draught vessels and of the DG range.*

1.6 COMPANY AND MASTER'S ORDERS

The following extracts are taken from the ship manager's Navigation and Bridge Organisation Manual:

Anchoring

…..During anchoring, the Master must ensure that speed over the ground is monitored. The scope of the cable to be used should provide maximum holding power……

Requirements for Vessels at Anchor

Once anchored, the ship's position is to be fixed and the heading noted. The position of the vessel and the amount of cable paid out is to be entered in the Deck Log Book and Bell Book. A careful inspection of the swing area, both on the chart and around the ship, is to be made to ensure vessel will remain clear of hazards or shoals. The Master shall inform the officer of the watch about the requirements for safeguarding the vessel at anchor.

The position of the vessel must be checked frequently, plotted on the chart and entered in the Deck Log Book. The activity of other vessels, change of tide and swing about the anchor must be carefully monitored. The time of start and finish of the vessel's swing is to be recorded on the Deck Log Book. Any unusual occurrence must be reported to the Master immediately.

1.7 RELEVANT CREW

1.7.1 The master

The master was German. He first went to sea in 1983 and qualified as a ship's mechanic in 1987. After spending 3 years at the Hamburg Polytechnic, he joined Shell as a third officer in 1990, and was promoted to second officer in 1991, and then chief officer in 1994. The master left Shell in 1996 and, after serving in chemical tankers, joined Carl F Peters in April 2000. He joined *Willy* in October 2001. This was his fourth visit to Plymouth in the previous 12 months, and on three of these visits he had anchored in Cawsand Bay.

1.7.2 The chief officer

The chief officer was Slovenian and had been at sea since 1975. He was promoted in 1979, and had served mainly in product carriers. This was his seventh contract with Carl F Peters. Since joining *Willy* on 1 November 2001, the chief officer had worked every day, during which he had had the opportunity to sleep about 7.5 hours daily. He was content with the amount of rest time available, and had never felt particularly tired while on board. Before coming on watch on the evening of 1 January, the chief officer had not consumed any alcohol, drugs, or medication.

1.7.3 The chief engineer

The chief engineer was German. He had been at sea since 1964, and joined Carl F Peters in 1992. He had served on board *Willy* for 3 years, and had devised the ship's planned maintenance system, which was also used on two sister ships.

1.7.4 The second engineer

The second engineer was Filipino, and had been at sea since 1977. He joined *Willy* on 4 December 2001, and was considered by the chief engineer to be a good engineer who could not have started the engine more quickly than he did.

1.8 NAVIGATION EQUIPMENT

Willy was fitted with 2 bow anchors, each weighing 1445kg, with 8 shackles of chain cable, which had last been replaced in October 1999. A spare bow anchor was also carried. The GPS receiver was located above the radar display and could be monitored by the OOW while seated in the bridge chair. Following the accident, the GPS receiver was removed from the ship and examined ashore. Information retrieved from the receiver indicated that the position on which the 3-cable guard zone was centred was 50°19.85N, 004°10.94W **(Figure 2)**, which was 5.6 cables away from the position when aground.

1.9 CHARACTERISTICS AND HISTORY

When at anchor in ballast, *Willy* was affected more by the wind than the tidal stream, and also pitched more because of her light condition. The master had not experienced any problems when at anchor in Cawsand Bay on previous occasions, but had dragged anchor at the Maas anchorage (off Rotterdam) on 7 November 2001. On that occasion he decided to weigh anchor and put to sea. The chief engineer recalled that, 3 or 4 times during his 3 years on board, other masters had ordered the engine to be running in bridge control, when the conditions at an anchorage had given cause for concern.

1.10 ENGINE READINESS

The time taken to have the main engine running and in bridge control was normally between 10 and 15 minutes. This was the time required to start the various pumps, open the air bottles, start the engine, and transfer control to the bridge. In an emergency, this could be reduced to about 4 minutes.

1.11 OBSERVATIONS FROM ASHORE

When at anchor in Cawsand Bay, a member of a local Coastwatch group could see *Willy* from her sitting room window. The observer had noted that *Willy* had been snatching her cable during the afternoon of 1 January and, after assessing that between about 2320 and 2335 *Willy* was drifting to the west, she immediately alerted Longroom Port Control by telephone.

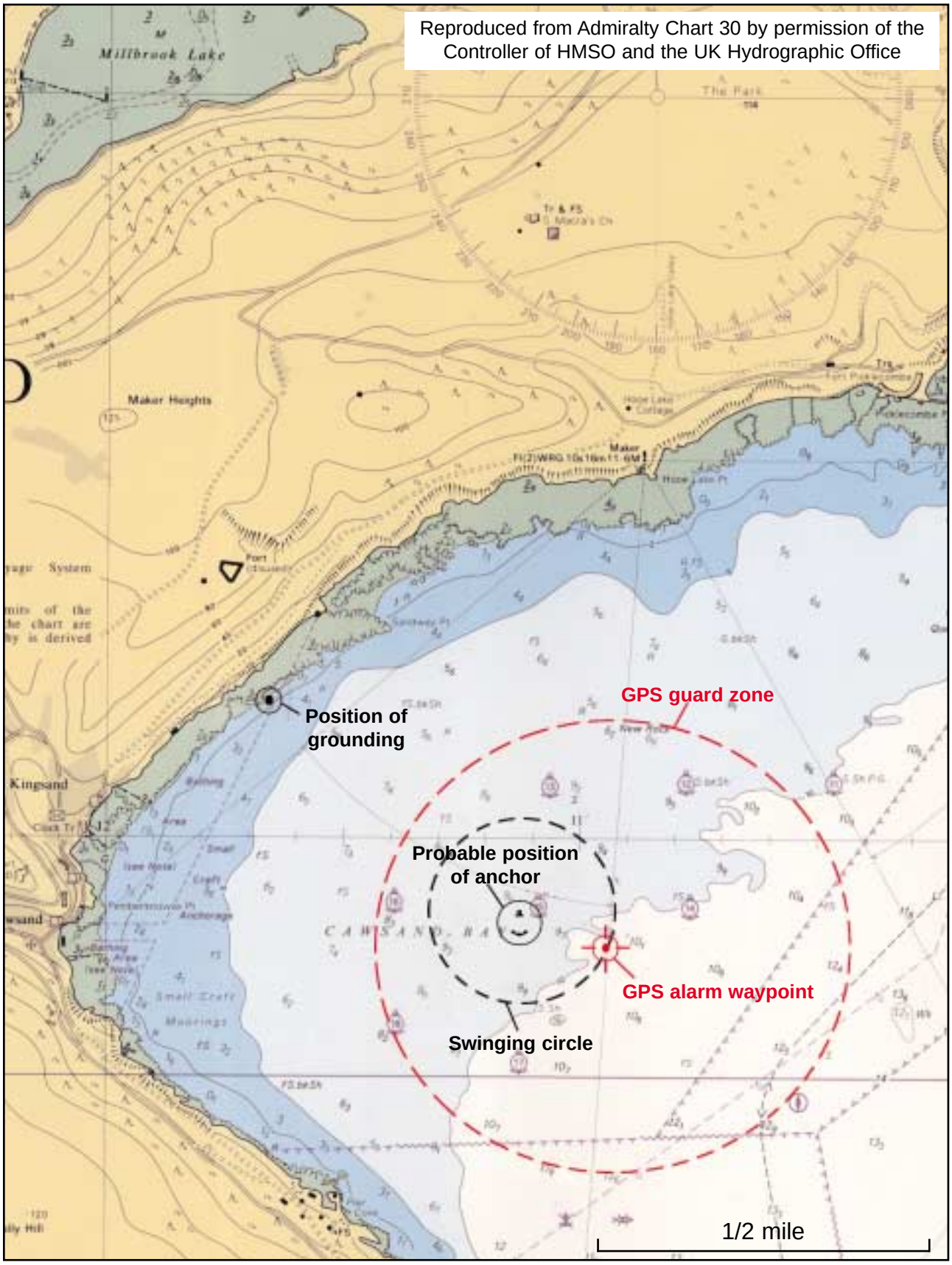

Chart extract showing *Willy*'s estimated anchorage position, swinging circle and GPS guard zone

1.12 ENVIRONMENTAL CONDITIONS

While at anchor, the following were among the weather forecasts received by the ship via Navtext for sea forecast area Plymouth:

Issued by the Meteorological Office at 1800 on 31 December

Southeasterly 5 to 7, occasionally gale 8 later in south. Mainly fair. Good…Outlook following 24 hours: Strong southeasterly winds west of 02W….Gale possible south Fastnet, and south Plymouth for a time.

Issued by the Metereorological Office at 1800 on 1 January

Southeasterly 5-7, occasionally gale 8, Rain later. Moderate or good. Outlook following 24 hours: strong southeasterly winds gradually easing from the southwest, occasionally gale force at first in Plymouth.

Records of wind speed, measured by an anemometer sited on Plymouth breakwater, indicate that on 1 January the wind increased from 15 knots at 1600, to 19 knots at 2200, and to 24 knots at 2300. Gusts of up to 30 knots, however, were also observed. The wind speed and direction recorded in *Willy's* deck log during the evening of 1 January was south-east, force 7.

High water at Plymouth on 1 January was at 1922, and it was 88% spring tides. The predicted height of tide at 2240 was 5.2m. It was a brilliant moonlit night.

1.13 PORT CONTROL

1.13.1 Control of movements, anchoring and mooring

All movements of vessels over 20m, and all anchoring and mooring within the limits of the Dockyard Port of Plymouth are controlled by QHM via Longroom Port Control. Prohibited anchorages are shown on current BA charts, and regulations specific to vessel types and condition are contained in The Dockyard Port of Plymouth Order 1999, which states:

No merchant or other private vessel-

(a) carrying hazardous, dangerous or noxious substances……as cargo; or

(b) which is in ballast having previously carried any such substances as cargo, but which has not been gas-freed,

shall anchor or moor or secure alongside within the limits of the Dockyard Port save at a berth specified by the Queen's Harbour Master.

It also states that such vessels shall not anchor or moor within 1000m of any of Her Majesty's vessels at anchor or moored, without the permission of the Queen's Harbour Master. There are no other restrictions applicable to ships that are not gas-free. It is believed that two other ships were at anchor in Plymouth Sound on 1 January, one in Jennycliffe, and the other bunkering in anchorage No 2. There were no other ships in Cawsand Bay.

1.13.2 Radar and camera coverage

To assist Longroom Port Control meet its VTS function, radar coverage of Plymouth Sound is achieved by radar heads located at Longroom, and on Drake's Island. The diagram showing the combined radar coverage of these heads **(Figure 3)** shows that coverage of the deep water channels and main anchorages was satisfactory, but that much of Cawsand Bay was in a radar blind spot. When the pilot initially called, informing Longroom Port Control that *Willy* had anchored in No 15, she was painting on radar and the HCO estimated that she was about 0.5 cable to the south-east of the charted anchorage position. When *Willy* was lying to the west of anchorage No. 15, however, she could not be seen on the radar displays within the Port Control.

Figure 3

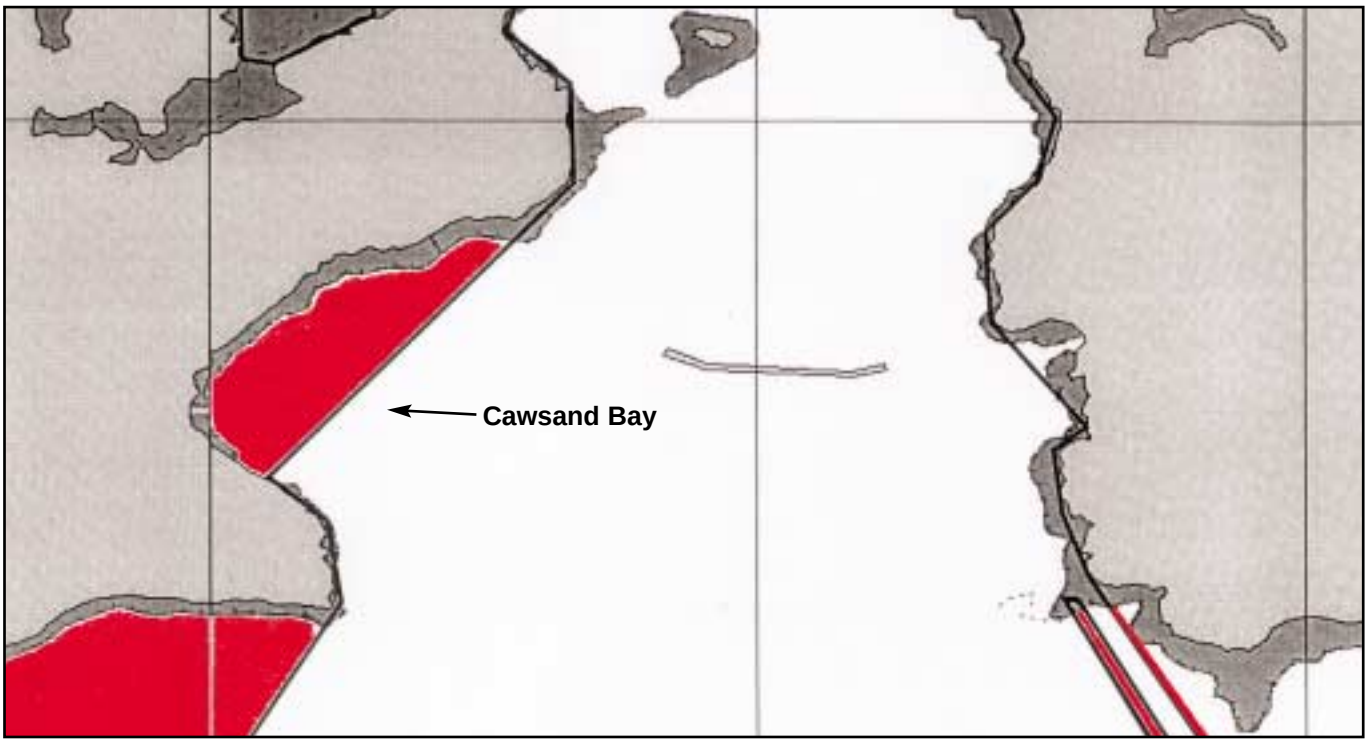

Diagram showing radar coverage in Plymouth Sound
- red areas indicate radar blind spots

A CCTV camera located on Maker Light, which should have provided views across Cawsand Bay during daylight, was found to be unserviceable on the morning of 2 January.

Planned improvements to the radar and CCTV coverage, which are being progressed as part of a programme of continuous improvement to the VTS in Plymouth, will provide enhanced radar and CCTV coverage in Cawsand Bay when implemented. These are planned to be completed by mid 2003.

1.13.3 Manning

Longroom Port Control is manned 24 hours per day by one of several harbour control officers – all of whom are Admiralty pilots – and an assistant. None of the harbour control officers interviewed were aware of any ships previously dragging anchor in Cawsand Bay.

1.14 ACTION TAKEN FOLLOWING THE ACCIDENT

1.14.1 QHM Plymouth

In addition to continuing with its radar and CCTV enhancements, QHM has also reviewed the anchorage allocation and monitoring process within Longroom Port Control, with a view to increasing the active monitoring of ships at anchor.

1.14.2 The MAIB

Following the grounding, which was the latest in a number of similar accidents, the MAIB issued Safety Bulletin 1/2002 **(Annex B)**, containing recommendations to ship owners and masters.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 THE AMOUNT OF CABLE USED

The amount of cable to be used when anchoring depends upon several factors including: the depth of water, the nature of the seabed, the amount of swing room available in relation to navigational hazards and other ships at anchor, the degree of exposure to bad weather, the rise and fall of the tide, the strength and direction of the wind and tidal stream, and the duration of the stay at anchor. Although there are several 'rules of thumb' for determining the amount of cable to be used relating to the depth of water, all of the above factors must be taken into consideration.

The decision to use 4 shackles of cable was based upon the master's previous experience at the anchorage, and the uncertainty of his length of stay. As this length of cable was between six and ten times the depth of water, depending on the height of tide, and the conditions initially gave no cause for concern, the amount of cable used is considered to have been reasonable. The cable also appears to have been laid out in a controlled manner after the anchor had been let go.

As the weather and sea conditions worsened, however, the ship became increasingly exposed to strong south-easterly winds. This forced the ship towards the edge of her swinging circle and, exacerbated by the ship's pitching motion caused by her light condition and swell, increased the loading on her cable and anchor. For an anchor to achieve its maximum holding power, it is important that sufficient cable leads along the seabed before rising to the hawse pipe. In this case, it is probable there was insufficient cable given the prevailing weather conditions, depth of water, nature of the seabed, and condition of the ship, to prevent the increased weight from lifting the cable from the seabed adjacent to the anchor. This would have resulted in the angle of the lead of the cable from the anchor shackle to rise above the shank axis, thereby reducing the holding power of the anchor. Had more cable been used, the risk of the ship dragging her anchor, would have been reduced.

2.3 DETECTION OF DRAGGING

When the master arrived on the bridge, he noticed that the ship's speed over the ground by GPS was 1.3 knots. This later reduced to 0.4 knot, possibly as a result of the scope of the cable increasing in the shallower water and the variable effects of the wind. Nevertheless, the overall speed at which the ship dragged her anchor, limited the time available for her crew to detect the ship's movement and take corrective action, to about 16 minutes.

Rapid detection was therefore essential, and should have been achievable had it been possible to continually check the ship's position relative to her bridge swinging circle, which was about 220 yards. However, although the ship's position was checked periodically, because the position of the anchor had not been accurately determined, and the swinging circle had not been calculated or plotted, the OOW had no immediate indication of whether the ship lay inside or outside her swinging circle. This contributed to the time taken by the chief officer to confirm the ship was dragging her anchor, after being alerted by the GPS alarm.

The GPS guard zone, however, did not alert the OOW as soon as the anchor started to drag. This was because it had been set at a distance almost three times the radius of the bridge swinging circle. **Figure 2** shows an estimation of *Willy'*s anchorage position, her bridge swinging circle, and the GPS guard zone. This is based on the ranges and bearings recorded on 1 January, the information retrieved from the GPS receiver, the range of the shore when the GPS alarm sounded, and the accounts of witnesses. It is evident from this estimation, that the guard zone was not initiated until the ship had laid out her cable to the east, and the ship would have moved over 0.5 cable out of her bridge swinging circle before the alarm activated.

Had the GPS guard zone been centred on the position of the anchor, and at a distance equivalent to the bridge swinging circle, this would have provided immediate detection of the ship dragging her anchor. Although a margin of error when deciding the distance might be appropriate to reduce false alarms, this should be limited to the potential navigational error in determining the position of the anchor. In this case, considering the distance from the charted anchorage position to the shore was 4.3 cables, the use of a 3-cable guard zone was inappropriate.

The master was not informed of the situation until about 7 minutes after the anchor had started to drag. Had the ship's movement been detected, and the master been advised sooner, more time would have been available for him to initiate corrective action.

2.4 ONBOARD RESPONSE

The proximity of the lee shore to the north-west, the delay in confirming the ship was dragging her anchor, the rate at which the ship was dragging her anchor, and the notice of the engine, required immediate corrective action to be taken if grounding was to be avoided. No action was taken, however, until the master ordered the engine to be started. As a consequence, by the time the engine was running and in bridge control, it was too late to manoeuvre the ship clear of danger. This was despite the fact the second engineer managed to have the engine available in less than half the time normally taken.

No consideration appears to have been given to paying out additional cable, which is an alternative measure frequently taken when an anchor is found to be dragging in order to optimise its holding power. Four further shackles were available, and such action could have been initiated by the chief officer via the on-watch AB.

In emergency situations, there is considerable benefit to be gained by masters encouraging OOWs, either through their standing or night orders, or verbally, to take corrective measures before, or while informing them of the situation. In this case, had the chief officer started the engine and prepared to work the cable as soon as he realised the ship was dragging her anchor, valuable time would have been saved, and grounding might have been avoided.

2.5 THE ROLE OF PORT CONTROL

Longroom Port Control was not actively monitoring *Willy*'s position at anchor because she was in a radar blind spot, and the CCTV camera on Maker Light was either not working or not used, although this would have been of little assistance during darkness. This situation was not ideal. It is important for a VTS to have sufficient radar coverage of its area in order to meet safely its responsibilities towards traffic monitoring, harbour management, and assisting masters discharge their duties. This was difficult to achieve within Cawsand Bay, and the plans to improve radar and CCTV coverage in this area are, therefore, considered to be appropriate.

Notwithstanding this, although Port Control is responsible for allocating anchorages within Plymouth Sound, the responsibility for monitoring position, and taking appropriate precautions, rests with masters. The Port Control has an obvious interest in the safety of all ships in its VTS area, however, and the action taken to review its anchorage allocation and monitoring process potentially will improve support to masters when at anchor.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

3.1.1 Cause

Strong winds caused *Willy* to drag her anchor and ground.

3.1.2 Contributing factors

1. The ship was exposed to strong south-easterly winds in Cawsand Bay which, together with her pitching caused by her light condition and the swell, increased the loading on her cable and anchor. [2.2]

2. There was insufficient cable given the prevailing weather conditions, depth of water, nature of the seabed, and condition of the ship, to prevent the cable from lifting from the seabed and reducing the holding power of the anchor. [2.2]

3. The speed at which the ship dragged her anchor, limited the time available for her crew to take corrective action, to about 16 minutes. [2.3]

4. Rapid detection of the anchor dragging was hindered by its position not being accurately determined, the swinging circle not being calculated or plotted, and the GPS guard zone being set at a distance almost three times the radius of the swinging circle. [2.3]

5. The master was not informed of the situation until about 7 minutes after the anchor had started to drag. [2.3]

6. The engine could not be started and made available in sufficient time to allow the ship to be manoeuvred clear of danger. [2.4]

3.1.3 Other findings

1. The use of a 3-cable guard zone was inappropriate. [2.3]

2. The GPS guard zone was centred on a position on the eastern limit of the swinging circle. [2.3]

3. A further 4 shackles of cable were available but not used. [2.4]

4. Had the chief officer been empowered or prepared to start the engine and work the cable as soon as he realised the ship was dragging her anchor, valuable time would have been saved, and grounding might have been avoided. [2.4]

5. Responsibility for monitoring the ship's position, and taking appropriate precautions to ensure her safety, rested with the master, not QHM. [2.5]

6. The plans to improve radar and CCTV coverage in this area are considered to be appropriate. [2.5]

7. The action taken by Longroom Port Control, to review its anchorage allocation and monitoring process, will potentially improve support to masters when at anchor. [2.5]

SECTION 4 - RECOMMENDATIONS

The MAIB has no further recommendations to add to those contained in Safety Bulletin 1/2002 **(Annex B)**.

Marine Accident Investigation Branch
October 2002

ANNEX A

Extract of *Willy*'s deck log book for 1 January 2002

Voyage No. 781 **from** [illegible] **towards** [illegible]

(Charterer voyage No. _____) | in port / roads of CAWSAND BAY, PLYMOUTH

21 Look out	22 Roll period	23 Nautical remarks and entries according, national and international rules and regulations, measures taken in the interest of sea-worthiness, safety of life at sea, care of cargo, safety of the vessel an environmental protection.	24 Signature W.O.	25 Soundings of bilges/ empty tanks at _____ o'clock Comp.	26 Port	27 Mid
		00[00] Fire Safety Round carried out – ok				
REYER		02[00] "Penlee Point" 1 179° x 0.8'				
		04[00] "Penlee Point" 1 180° x 0.81' – Fire Safety Round carried out – ok.				
FRANCESCO		06[00] "Penlee Point" 1 181° x 0.89' Hdng. 160°				
		08[00] Plymouth breakwater w head / 084° x 1.08 nm off				
DANIEL		10[00] Plymouth breakwater w head / 084° x 1.07 nm off				
		12[00] Plymouth breakwater w head / 084° x 1.07 NM off				

Check off

- Synchronized watches:
- Sound signal equipment
- Smoke detecting device:
- Gas detecting device:
- Emergency battery V.
- Passenger vessels: aut. door lock deck main cross bulkheads:

Domestic water consumption t; Wash water consumption t; Ballast water t; [illegible] t

Domestic water ballance t; Wash water ballance t; [illegible] t; Feedwater ballance t

Regulation lights exhibited from midnight till from till midnight

Chief Mate _____ Master _____

21	22	23 Nautical remarks and entries	24	25	26	27
		14[00] Penlee Point 1 180° x 0.9' – Hdg. 150°				
		16[00] Penlee Point 1 180° x 0.92 – Hdg. 160°				
		18[00] Penlee Point 1 180° x 0.90' Hdng. 105°				
		20[00] Plymouth breakwater w head 0.84 x 1.07 nm off				
		22[00] Plymouth breakwater w head 0.84 x 1.09 nm off				

ANNEX B

MAIB Safety Bulletin 1/2002

Safety Bulletin

MAIB

DTLR
TRANSPORT
LOCAL GOVERNMENT
REGIONS

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

MAIB SAFETY BULLETIN 1/2002

Grounding of product tanker

Willy

Cawsand Bay, Cornwall

1 January 2002

Issued January 2002

MAIB

MAIB SAFETY BULLETIN 1/2002

This document, containing Safety Recommendations, has been produced for marine safety purposes only on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch (MAIB) is carrying out an investigation of the grounding on 1 January 2002 of the product tanker *Willy*. The MAIB will publish a full report on completion of the investigation.

This is the latest of several groundings in recent years that have resulted from vessels dragging their anchor. This Safety Bulletin is issued to remind owners and masters of the procedures and precautions to be considered when anchoring, especially in confined waters when an anchorage becomes exposed to onshore weather conditions.

J S Lang
Rear Admiral
Chief Inspector of Marine Accidents

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Public Enquiries: 020 7944 3000
INTERNET ADDRESS FOR DTLR PRESS NOTICES:

SAFETY RECOMMENDATIONS

Background

The grounding of the product tanker *Willy* is the latest in a number of similar incidents that have occurred in UK waters in recent years. The circumstances of each have been very similar: a vessel anchors in what is judged to be a secure anchorage, but then drags when the weather subsequently deteriorates.

The Incident

Having discharged her cargo at Cattewater in Plymouth Sound on 30 December 2001, *Willy* shifted to a designated anchorage in Cawsand Bay to await orders. She anchored in a position nominated by the harbour authority in a depth of 9.6m. She used her port anchor with 4 shackles in the water, and this gave a stern swinging circle of 1.25 cables.

As an anchorage, Cawsand Bay is sheltered from all but south-east winds and the holding ground is mainly sand and broken shells. The nearest dangers to *Willy* were rocks some 4.25 cables to the north-west.

After anchoring, her position was established using radar ranges and bearings and, using the GPS receiver, a 3-cable guard zone was set around the position of the anchor. The main engine was shut down, but remained available for use within 10 minutes. A bridge anchor watch was kept throughout by an officer of the watch (OOW).

The conditions on the day after she anchored, 31 December, gave no cause for concern, with the wind blowing from the north-east force 3 to 4. By noon the following day, it had veered to the south-east and increased to force 7. Although the anchorage was now exposed and the conditions were less comfortable with the ship heading into wind and pitching in the increasing swell, her anchor appeared to hold.

At about 2240, on 1 January, the GPS guard zone alarm sounded. The OOW confirmed by radar that the ship was outside the guard zone and moving in a north-westerly direction and towards the shore. He called the master, who immediately ordered the main engine to be started, and then went straight to the bridge where he saw how close the shore was. He also noticed the GPS receiver displayed a speed over the ground of 1.2 knots. After ordering the OOW to go forward and heave in the anchor, he put the main engine to full ahead just as soon as it was available, but it was too late. Within seconds, the rudder and the propeller had struck the rocks. The time was about 2250.

She remained hard aground and was very badly damaged.

Comment

In an anchorage exposed to deteriorating weather conditions, a vessel will remain safely at anchor so long as there is sufficient scope on the cable and the anchor continues to bite. Mariners will readily understand, however, that in certain situations and especially in deteriorating weather, vessels at anchor run the risk of dragging.

In the incidents investigated by the MAIB it seems that a feature common to them all is that those on board failed to recognise what was happening until the vessel concerned had already begun to drag well outside the swinging circle. In many instances the speed, sometimes as much as 1½ to 2 knots, was such that the time available to take corrective action was insufficient to prevent the vessel running aground on a lee shore.

It is, therefore, imperative that when anchored in close proximity to any hazard, or in an anchorage that has become exposed and a lee shore is close by, that any movement outside the calculated swinging circle is detected immediately so that steps can be taken to remedy the situation.

Those charged with keeping an anchor watch must ensure that they are well placed to detect dragging as soon as it starts, even though they may have taken various precautions to prevent it. Whatever means is adopted to check the vessel's position it must be sufficiently foolproof to give an instant warning of movement. Too often watchkeepers believe their means of checking their vessel's position is adequate. Experience reveals that such optimism is often misplaced. Every second counts.

If dragging is detected or suspected watchkeepers must, in addition to calling the master, be prepared to take immediate action themselves. Bringing the engine to immediate notice, preparing to let out more cable, or even letting go the second anchor are basic precautions.

In deteriorating weather conditions, the situation should be reassessed and precautionary measures taken to meet the additional risk of dragging. It is often safer to be at sea than in an exposed anchorage with a lee shore close by.

Safety Recommendations

Ship owners and masters should:

1. Ensure that watchkeeping practices and electronic navigational aids are optimised to provide immediate detection of a ship dragging her anchor.

2. Carefully consider the prevailing and forecast conditions when determining the amount of cable to be used when anchoring or when at anchor.

3. Ensure that the availability of engines is appropriate to the proximity of dangers and the prevailing and forecast conditions when at anchor.

4. Consider using a second anchor, or at least having it available for emergency use.

5. Carefully reconsider the safety of the anchored position in deteriorating weather conditions.

6. Not hesitate to shift anchor berths, or put to sea when there is an unacceptable risk of dragging, particularly when anchored off a lee shore.